southern hemisphere to cool the ocean waters and still further lower the temperature of the Gulf Stream, and also the tropical currents of the oceans, including the great Japanese current, the ice period of both hemispheres would be brought about during the same era. For it is well known to those who have studied the subject that the Gulf Stream derives a large portion of its heat from the south Atlantic; which would not be the case should the waters of the southern hemisphere be chilled by ice. For it appears that all of the south Atlantic islands during frigid times were burdened with glaciers. Even the island of St. Helena, situated in the tropical zone, has the appearance of having been heavily iced during some remote period. Its steep ravines, which deepen as they approach the sea, recall to the southern voyager the ice-worn islands of the higher latitudes. Thus when the temperate regions of both hemispheres were heavily iced the temperature of the tropical seas must have been comparatively low, especially on the eastern sides of the oceans which are swept by the polar currents. Moreover, the sea was much salter than now, on account of a large portion of its waters being absorbed by glaciers. Furthermore, whenever the arctic channels are filled with glaciers the independent circulation of the arctic waters must cease; consequently the Gulf Stream, meeting with less opposing polar currents on its sweep northward, would thus be able to gain a much higher latitude than now. Although its waters at first would be colder than they are to-day; still their superior saltness would add to their ability for dissolving ice wherever they were able to flow. But it appears that the Gulf Stream and other tropical currents of the northern oceans would not be able to subdue the cold accumulated in northern ice-sheets without the assistance of a comparatively warm ocean in the southern hemisphere. The southern seas being so much superior and so widely connected with the northern, the tropical currents of the latter seas would require the assistance of the southern oceans to subdue the cold of a northern ice period, in the same degree that it required their co-operation to bring about the frigid period. The arctic straits, which now facilitate the independent circulation of cold Arctic waters, would, when filled with glaciers, be slow to thaw out, even with the increasing warmth of the arctic regions, on account of being situated to the windward of the warm gulf currents. Therefore, the glaciers that filled their deep channels would be the last great body of ice to melt in the northern regions; and for this reason it is probable that there are fragments of the old ice of the last frigid period still unmelted and now form a portion of the lower shores of the arctic straits. This conclusion is in harmony with reports from Point Barrow which inform us that a stratum of pure ice is found beneath the scanty soil. The low temperature of the waters of the tropical oceans during the perfection of a frigid period must have been very destructive to oceanic life; while such as survived probably found refuge in nearly landlocked equatorial seas, where the waters were largely excluded from the colder ocean, and also freshened by such rivers as emptied into them. Meanwhile, the low temperature of the ocean must have chilled the atmosphere over the land to such a degree as to have caused the destruction of many species of animals.

C. A. M. TABER.

Lake Como, Florida, Feb. 5.

Electricity in Agriculture.

THE abstract under the above title in *Science* for Jan. 15, 1892, which I have only just found time to read, proves very interesting to me, and I do not wish in any way to have it inferred that I disbelieve in the influence of electricity, at least indirectly, upon the growth of plants; but it does not seem out of place to call attention to the fact that the comparative rarity of mildew on plants grown above electricity-bearing copper wires in moist soil may be due to the action of the copper salts formed in killing the mildew rather than to electrical action.

The roots of the lettuce in the experiment mentioned at "Garden A" (*Science*, p. 36) are stated to have "grown about the wires, as if there they found the greatest amount of nourishment," etc. This would also be the result from the roots seeking the environment best suited for growth, if the mildew could not thrive about the wires on account of the trace of copper salts which the soil contained.

The use of sprays containing copper salts, in the form of Bordeaux mixture or similar compounds, as a preventive of mildew of grape-vines and other plants is well known, and the control plot, "Garden B," should have been provided with copper wires, exactly as was "Garden A," to make the results of the experiment conclusive. As I have not seen the original article in the Bulletin of the Hatch Experiment Station, from which the abstract in *Science* was taken, it may be the fact that this action of the copper salts upon mildew has been discussed there.

GEORGE DIMMOCK.

Canobie Lake, N.H., Feb. 15.

AMONG THE PUBLISHERS.

E. & F. N. SPON & CO. announce "Roll Turning for Sections in Steel and Iron," by Adam Spencer. The subject of roll-turning is treated from a purely practical point, and for practical men. The drawings are the result of experience, and their value consists in the fact that they are working drawings, that is, drawings of rolls which have passed through the ordeal of actual work. The arrangement of the work is as follows: First, drawing of modern blooming for steel slabs, followed by a pair of billet rolls, then various sections showing the related grooves in cogging, roughing, and finishing rolls, with the position and character of collars required. "A Text-Book of the Science of Brewing," by Edward Ralph Moritz and George Harris Morris. The following extract from the introduction will show its character: "The object of this work is to provide in a convenient and accessible form such knowledge of the processes of brewing and of the materials employed in that industry as is at our disposal; and — so far as we are able — to connect such knowledge with the practice of brewing. We therefore intend it as a text-book in which may be found the results of scientific research together with the practical conclusions which we consider justly deducible from them. We do not pretend that a perusal of our work will enable a novice to brew beer; neither will a study of it convert a purely practical man into a chemist. It is meant, however, to lead the brewer to a better understanding of what we may term the physiology and pathology of brewing, and, by so doing, put at his disposal a means for more efficient control over his operations." "Manual of Instruction in Hard Soldering," by Harvey Rowell. "The Mechanical and Other Properties of Iron and Steel in Connection with Their Chemical Composition," by A. Vosmaer, engineer. The author has gathered together the widely scattered information on this important subject, and gives in brief outline the actual knowledge of the intimate connection that exists between the properties of steel and iron and their chemical composition. The elements — carbon, manganese, silicon, phosphorus, sulphur, copper, chromium, titanium, tungsten, aluminium, nickel, cobalt, arsenic, antimony, zinc, lead, tin, silver, molybdenum, vanadium, potassium, sodium, barium, strontium, calcium, and magnesium — have been considered separately and in the following manner: First, as to the metallurgical behavior of the elements in question; next, to deal with their influence on pig iron, cast iron, wrought iron, and steel; lastly, the special uses made of them, and their occurrence in manufactured objects. The gases, intermolecular, reaction, and mixed, have been carefully considered, and analyses given of foundry, bessemer, basic, and forge pig-irons, spiegel-irons, ferromanganese, ferrosilicons, ferrochromes, ferrotungsten, ferroaluminium, cast-irons, weld irons. Steel — railway material, structural steel, ordnance material, miscellaneous. With a diagram of silicon in cast iron, and of disappearance of carbon. Also a new edition of "A Practical Treatise upon Warming Buildings by Hot Water."

— Morris Phillips of the *Home Journal* goes abroad every summer for recreation and business. He has kept up that habit for nearly twenty years, besides travelling widely over this country, and as a result of his experiences he has just compiled a note-book of practical hints for tourists entitled "Abroad and at Home," in which he gives incidents of his travels, as well as a